

Wytheville, $\frac{1}{2}$ inch. *Washington Territory*: Spokane Falls, 5 inches. *West Virginia*: Flemington, 1 inch; Morgantown, $\frac{1}{2}$ inch. *Wisconsin*: Beloit and Embarrass, $\frac{1}{2}$ inch.

Hail.—Dubuque, 20th, from 7.03 to 7.08 p. m. Bangor, Me., 18th, a slight hail storm between 10 and 11 a. m. North Volney, N. Y., 12th. Greensboro, N. C., 29th. Wytheville, Va., 1st, 29th. Albany, 8th.

Rain, Hail or Snow from a Cloudless Sky.—Wellington, Kan., 7th, shower of spongy hail, lasting three minutes. Bainbridge Island, Wash. Ty., 18th, rain. Dyberry, Pa., snow, lasting 30 minutes.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 73 to 79; Middle Atlantic States, 67 to 80; South Atlantic States, 66 to 83; Florida Peninsula, 75 to 78; East Gulf States, 68 to 79; West Gulf States, 68 to 85; Rio Grande Valley, 72 to 85; Ohio Valley and Tennessee, 70 to 77; Lower Lake Region, 66 to 80; Upper Lake Region, 66 to 87; Extreme Northwest 71 to 87; Upper Mississippi Valley, 65 to 79; Missouri Valley, 65 to 70; Northern Slope, 53 to 71; Middle Slope, 47 to 70; Southern Slope, 56 to 75; Southern Plateau, 50 to 63; Middle Plateau, 42 to 80; Northern Plateau, 73 to 86; North Pacific Coast Region, 84 to 86; Middle Pacific Coast Region, 84 to 86; South Pacific Coast Region, 47 to 80. *High stations* report the following percentages not corrected for altitude: Cheyenne, 48.0; Pike's Peak, 66.4; Mt. Washington, 84.4.

WINDS.

The prevailing winds during the month of December, 1881, at Signal Service stations, are shown on chart No. II, by arrows, which fly with the wind. Throughout the Ohio Valley, Lake Region, Upper Mississippi Valley, and New England, the winds are *southerly*; in the Middle Atlantic States *westerly*; in the South Atlantic and Eastern Gulf States, *northeasterly*; in the Western Gulf States and Texas, *variable*; in the Missouri Valley, and Northwest, *northwesterly*; throughout the Northern Slope, Northern Plateau, and North Pacific Coast Region, *south to west*; in California, *northwesterly*; elsewhere, *variable*.

Total Movements of the Air.—The following are the largest total movements at Signal Service stations: Mt. Washington, 31,104 miles; Pike's Peak, 17,972; Ft. Shaw, Mont., 13,651; Delaware Breakwater, 12,833; New Shoreham, R. I., 12,736; Kittyhawk, N. C., 12,595; Wood's Holl, Mass., 12,166; Thatchers Island, Mass., 12,064; Hatteras, N. C., 12,035; Cape May, 12,018; Sandy Hook, N. J., 10,791; Sandusky, 10,339; Ft. Benton, Mont., 10,118; Portsmouth, N. C., 9,762; Ft. Assinaboine, Mont., 9,661; Indianola, 9,621; Barnegat, N. J., 9,524; Macon, N. C., 9,376; Champaign, Ill., 9,321; Port Eads, 9,303; Cheyenne, 9,174; Buffalo, 9,172; Rochester, 9,126; Cape Henry, Va., 8,799; Grand Haven, 8,728; Milwaukee, 8,456; St. Vincent, Minn., 8,405; Key West, 8,256; Atlanta, 8,158; Burlington, Vt., 8,069; Boston, 8,047. The *smallest* are: La Mesilla, N. M., 725; Ft. Missoula, Mont., 1,359; Lynchburg, Va., 1,365; Salt Lake City, 1,473; Visalia, Cal., 1,700; Red Bluff, Cal., 2,250; Memphis, 2,365; Silver City, N. M., 2,452; Boise City, 2,534; Springfield, Mass., 2,892; Florence, Ariz., 2,939; Rio Grande, Tex., 2,970.

High Winds.—On the summit of Mt. Washington the highest velocities recorded were: 170 miles, NW., 1st; 100, NW., 2d; 104, W., 14th; 126, SW., 22d. The dates other than those above mentioned, on which velocities exceeding 75 miles per hour occurred, are as follows: 6th to 10th, 12th, 13th, 15th, 17th, 18th, 20th 24th to 26th, 29th, 30th. On summit of Pike's Peak, maximum velocity, 76 miles, NW., occurred on the 29th; velocities of 50 miles or over were recorded as follows: on the 5th, 10th, 12th, 27th, 28th, 30th. Other high velocities were reported by the following stations: Ft. Assinaboine, Mont., 50 miles, SW., 26th; Ft. Benton, Mont., 52, NW., 7th; Ft. Custer, Mont., 52, W., 11th; Port Eads, La., 52, E., 25th; Cape May, 52, NW., 7th; Delaware Breakwater, 54, NW., 23d; Kitty Hawk, N. C., 56, N., 15th.

Local Storms.—Fremont, Ohio, 9th, several buildings wrecked; unusually high westerly winds during the day. Terrene, Miss., 13th, "heaviest storm ever known here, occurred during the evening." Pensacola, Fla., 25th, heavy SE. gale; signs, etc., blown down; bark driven ashore outside of harbor. Macon, N. C., 27th, heavy SW. gale; fishing smack blown ashore.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for December, 1881, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 88.95 per cent. The percentages for the four elements are: Weather, 90.28; Direction of the Wind, 89.42; Temperature, 88.66; Barometer, 87.29 per cent. By geographical districts they are: For New England, 91.8; Middle Atlantic States, 91.5; South Atlantic States, 91.6; Eastern Gulf States, 88.6; Western Gulf States, 85.4; Lower Lake Region, 89.8; Upper Lake Region, 88.6; Tennessee and the Ohio Valley, 88.4; Upper Mississippi Valley, 86.3; Lower

Missouri Valley, 87.2; Northern Pacific Coast Region, 92.5; Central Pacific Coast Region, 89.2; Southern Pacific coast region, 86.9. There were 70 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 1.83 per cent. Of the 3,743 predictions that have been made, 57, or 1.52 per cent. are considered to have entirely failed; 53, or 1.42 per cent. were one-fourth verified; 391, or 10.45 per cent. were one-half verified; 485, or 12.95 per cent. were three-fourths verified; 2,757, or 73.56 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—139 Cautionary signals were displayed during the month of December, 1881, of which 125, or 89.92 per cent., were fully justified by winds of twenty-five miles per hour, or over, at or within a radius of 100 miles of the station. Ninety Off-shore signals were displayed, of which 73, or 81.11 per cent., were fully justified; 86 or 95.55 per cent., were justified as to direction; 88, or 97.77 per cent., were justified as to velocity. Thirty-nine Off-shore signals were changed from Cautionary. Thirteen Northwest signals were displayed, all of which were fully justified. 242 signals of all kinds were displayed, of which 210, or 86.77 per cent. were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. 147 winds of 25 miles or over, were reported, for which no signals were ordered. 44 signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of December, 1881. In general the principal rivers of the country have remained at a moderate stage throughout the month. The formation and breaking up of ice has to a considerable extent interfered with the taking of river observations. At La Crosse the river was frozen over from the 10th to the 19th; Yankton, 1st to 27th and St. Paul, 9th to 14th. In the Mississippi the highest water occurred at Memphis on the 31st when it reached within 4 feet 4 inches of the danger-line. The Missouri reached within from 11 to 17 feet of the danger-line at stations between Leavenworth and Yankton. The Ohio reached its highest water at Pittsburg on the 28th, within 3 feet 2 inches of the danger-line. The Red, Cumberland, Tennessee, Monongahela and Savannah rivers reached their highest stage between the 23rd and 31st, generally after the 27th, the water reaching within from 11 to 15 feet of the danger-line.

Ice in Rivers and Harbors.—*Missouri River:* Yankton, river frozen from 1st to 26th; open on 27th. Leavenworth, 30th, slush ice in river. *Lake Huron:* Alpena, 9th, 10th, 11th, 18th, 27th, floating ice; 15th, bay and river partly frozen over. *Connecticut River:* Springfield, Mass., 12th, river frozen. *Lake Superior:* Duluth, 31st, floating ice inside the Breakwater. *Maumee River:* Toledo, 11th, floating ice. *Hudson River:* Albany, 11th, river frozen; 12th, 13th, 16th, floating ice; 14th, 18th, river free from ice. *Rock River:* Rockford, Ill., 10th, floating ice; 11th, frozen, over; 13th, clear of ice; 15th, floating ice; 19th, clear of ice; 30th, river frozen. *Muscatine River:* Muscatine, Ia., 4th, clear of ice; 10th, floating ice; 13th, ferry boats stopped running on account of ice. *Kennebec River:* Gardiner, Me., 11th, river closed; 14th, ice broke in river; 16th, river closed; 30th, river open. *Grand River:* Lansing, Mich., 10th, river closed; 13th, river open; 31st river closed. *Mississippi River:* Dubuque, 10th, 30th, floating ice in river. Burlington, 30th, 31st, floating ice in river. Keokuk, 31st, floating ice in river. La Crosse, 10th, 31st, river frozen. Davenport, 19th, 30th, 31st, floating ice in river. St. Paul, 9th, 31st, river frozen; 4th, 8th, 30th, floating ice; 15th, river frozen along the shores; floating ice in channel; 22d, river nearly clear of ice; 30th, gorge threatened in river. The following stations report an unusual absence of ice: Lawrence, Kan., river free from ice throughout the month; Northport, Mich., 31st, no ice in Lake Michigan or Traverse Bay; Clear Creek, Neb., 31st, first December for eight years that Platte river did not freeze.

Closing of Navigation.—Burlington, Ia., 3d, all boats on the Upper Mississippi have gone into winter quarters; the last boat that touched this point was the "White Eagle," bound for St. Louis; river reported clear of ice from this station northward to St. Paul. La Crosse, 31st, navigation closed. Cleveland, 15th, navigation virtually closed; nearly all vessels laid up and out of commission; all regular lines have suspended for the winter. Chicago, 30th, navigation generally closed; occasional "arrivals and clearings" are likely to continue as long as the weather permits. Albany, 8th, canal closed; navigation on river practically ended. Catawissa, Pa., 14th, navigation on north branch of canal closed.

Floods.—*Illinois:* Ottawa, 22nd, very heavy and constant rains for the past three days; streams flooded and considerable damage done. *Virginia:* Petersburg, 22d, all streams greatly swollen by heavy rains and several bridges washed away. Belfield, 23d, bridge over the Meherrin river washed away. *Tennessee:* Nashville, 25th, the low lands in northern section of the city have been flooded during the past few days; no damage reported. *New York:* Albany, 23d, heavy freshet interfering with river navigation. 28th, heavy rains caused freshet in river, submerging docks and flooding cellars along Quay street; damage slight. Poughkeepsie, 23d, river unusually high.